

Langmuir Monolayers of C_{17} , C_{19} , and C_{21} Fatty Acids. Textures, Phase Transitions, and Localized Oscillations

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The phase diagrams of Langmuir monolayers of heptadecanoic (C_{17}), nonadecanoic (C_{19}), and heneicosanoic (C_{21}) acids have been determined from pressure-area isotherms, and from direct observations of the monolayers using Brewster angle microscopy. In this paper, we describe the observed domains, textures and phase boundaries for all mesophases presented by these fatty acids between 2° and 45°C. The phase diagrams of the three fatty acids can be superposed moving the temperature scale according to the number of carbons in the tail of the fatty acids. The L_2/O_v phase transition, which is not detected through isotherms, was observed in all the fatty acids under study. At low temperatures, CS , L_2' , and L_2'' phases of C_{21} were observed, as well as, the transitions among them. Also, we observed in C_{21} a new phase located among the phases L_2 , L_2' , and L_2'' . This phase was found recently, in the relative same place, in the fatty acid C_{20} with a tilting azimuth between the next neighbor and the next next-neighbor directions. In the crystalline phases of the monolayer of C_{21} , L_2'' and CS , we observed localized oscillations. These localized oscillations can be observed by long periods of time. The number of localized oscillations in the monolayer can be modified by long periods of relaxation or by heat treatment. Our results seem to indicate that these localized oscillations are areas with high density of defects, expelling material out of the monolayer. Therefore, they could be important in the events previous to the collapse.